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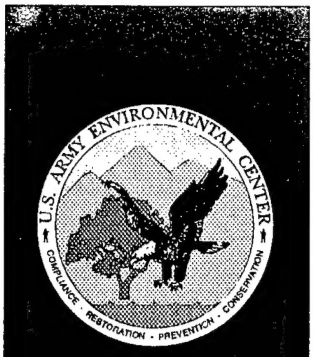

FINAL

No Further Action Decision Under CERCLA Study Area 59: Bridge 526

Fort Devens Main Post Site Investigation Fort Devens, Massachusetts

Prepared for:

U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND, MARYLAND 21010

Prepared by:

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Cambridge, Massachusetts 02140-2390

JANUARY 1995

FINAL

Arthur D Little

No Further Action Decision Under CERCLA

Study Area 59:
Bridge 526

Fort Devens Main Post Site Investigation, Fort Devens, Massachusetts

Submitted to

U.S. Army Environmental Center (USAEC)
Aberdeen Proving Ground, Maryland

Revision 1
January 1995

Arthur D. Little, Inc.
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ADL Reference 67064

DAAA15-91-D-0016/0004

Table of Contents

List of Figures

List of Tables

List of Acronyms and Abbreviations

ABB	ABB Environmental Services, Inc.
AWQC	Ambient Water Quality Criteria
BAF	Bioaccumulation Factor
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DDE	Dichlorophenyl-dichloro-ethylene
DOD	Department of Defense
EMO	Environmental Management Office
EPA	United States Environmental Protection Agency
ER-L	Effects Range-Low
IRDMIS	Installation Restoration Data Management Information System
IRP	Installation Restoration Program
MADEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
MEP	Master Environmental Plan
MSL	Mean Sea Level
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
PA	Preliminary Assessment
PAH	Polynuclear Aromatic Hydrocarbon
PCL	Protective Contaminant Level
PRE	Preliminary Risk Evaluation
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
SA	Study Area
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SVOC	Semivolatile Organic Compound
TPHC	Total Petroleum Hydrocarbons
TRC	Technical Review Committee
µg/g	Micrograms Per Gram (parts per million)
µg/L	Micrograms Per Liter (parts per billion)
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Center
VOC	Volatile Organic Compound

Executive Summary

Investigations of Study Area 59 (Bridge 526) at Fort Devens, Massachusetts, have resulted in the decision that no further studies or remediation are required at this site. Study Area 59 was identified in the Federal Facilities Agreement between the U. S. Environmental Protection Agency and the U.S. Department of Defense as a potential site of contamination.

Fort Devens was placed on the National Priorities List under the Comprehensive Environmental Response, Compensation and Liability Act as amended by the Superfund Amendments and Reauthorization Act on December, 21, 1989. In addition, under Public Law 101-510, the Defense Base Realignment and Closure Act of 1990, Fort Devens was selected for cessation of operations and closure. In accordance with these acts and to support the overall mission of environmental restoration and base closure, numerous studies have been conducted that address study areas at Fort Devens, including a Master Environmental Plan (Argonne National Laboratory, 1992), an Enhanced Preliminary Assessment (Weston, 1992), and Site Investigation Reports (ABB, 1992 and Arthur D. Little, 1993a).

The Site Investigation of Study Area 59 was completed in 1993 in conjunction with 12 other study areas as part of the Main Post Site Investigation. SA-59 is located at Bridge 526, part of Lovell Street as the road passes over Pond Brook (also known as Tail Race Brook). The brook discharges into the Nashua River approximately 700 feet southeast of the bridge.

The study area consists of a two-lane bridge on Lovell Road, which crosses Pond Brook, and that portion of Pond Brook potentially impacted by sandblasting and release of sandblast grit.

The bridge was identified as a study area in the *Enhanced Preliminary Assessment* (Weston, 1992), but was not listed in the *Master Environmental Plan* (Argonne National Laboratory, 1992). According to the Enhanced PA, the bridge was sandblasted and repainted during the late summer of 1990. Analysis of one sample of the grit produced by the sandblasting indicated a concentration of 1,275 µg/g of lead. To avoid discharge of the grit into the river, the contractor used a spent sandblast grit containment system during surface preparation and drummed the resulting waste. However, as a result of heavy rain and a possible discharge from the Lake Shirley Dam, the water level rose considerably and washed out the scaffolding and grit containment system. The Fort Devens Environmental Management Office (EMO) inspected the site and found sandblast grit on the stream banks, and on the bridge beams and abutments. The Enhanced PA reports that 10 soil samples collected by the EMO along the stream bank showed lead concentrations between 3.6 and 90 µg/g, with an average of about 32 µg/g. Documentation of the actual sample locations was not available.

The scope of work for the site investigation was limited to review of records and evaluation of surface water and sediment samples collected from adjacent locations.

Sediment and surface water samples were collected upstream of the bridge in Pond Brook and downstream of the bridge in the Nashua River, immediately downstream of the confluence of Pond Brook and the river. This data was used to evaluate the potential impact of sandblast grit released from the bridge to surface water and sediments.

Stream bank sediments collected by EMO indicated lead concentrations comparable to existing risk-based sediment criteria for lead. There is some potential for sandblast grit to migrate downstream in Pond Brook and to the Nashua River. However, results of Nashua River sediment sampling performed during the SI do not indicate that lead contamination from the study area has had a discernible impact on the River.

On the basis of findings at SA-59, there is no evidence or reason to conclude that the historic release of sandblast grit at SA-59 has caused significant environmental contamination or poses a threat to human health or the environment. The decision has been made to remove SA-59 from further consideration in the Installation Restoration Program (IRP) process.

1.0 Introduction

This decision document has been prepared to support a No Further Action decision at Study Area (SA) 59 - Bridge 526 at Fort Devens, Massachusetts. The report was prepared as part of the U.S. Department of Defense (DOD) Base Realignment and Closure (BRAC) program to assess the nature and extent of contamination associated with site operations at Fort Devens. Under Public Law 101-510, the Defense Base Realignment and Closure Act of 1990, Fort Devens has been selected for cessation of operations and closure. An important aspect of BRAC actions is to determine environmental restoration requirements before property transfer can be considered. Studies at SA-59 were conducted to support this overall mission.

In conjunction with the Army's Installation Restoration Program (IRP), Fort Devens and the U.S. Army Environmental Center (USAEC; formerly the U.S. Army Toxic and Hazardous Materials Agency) initiated a Master Environmental Plan (MEP) in 1988. The MEP consists of assessments of the environmental status of SAs, specifies necessary investigations, and provides recommendations for response actions with the objective of identifying priorities for environmental restoration at Fort Devens. On December 21, 1989, Fort Devens was placed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA).

An Enhanced Preliminary Assessment (PA) (Weston, 1992a) was also performed at Fort Devens to address areas not normally included in the CERCLA process, but requiring review prior to closure. A final version of the PA report (Weston, 1992b) was completed in April 1992. SA-59 was identified as a potential source of contamination in the PA. In 1992, DOD, through USAEC, also initiated a Site Investigation (SI) of SA-59 along with twelve other SAs as part of the Main Post Site Investigation at Fort Devens. The SI Report (Arthur D. Little, Inc. 1993), recommended No Further Action at SA-59.

2.0 Background and Physical Setting

2.1 Fort Devens Description and Land Use

Fort Devens is located in Middlesex and Worcester Counties, Massachusetts, approximately 35 miles west of Boston, Massachusetts. Fort Devens is located in portions of four towns - Ayer, Harvard, Lancaster, and Shirley. Fort Devens currently covers approximately 9,280 acres, consisting of the Main Post, North Post, and South Post areas. Massachusetts Highway Route 2 crosses Fort Devens and separates the Main Post from the South Post (Figure 2-1).

The majority of the facilities at Fort Devens lie within the Main Post, located north of Massachusetts Highway Route 2. The Main Post provides all of the on-post housing, including over 1,700 family units and 9,800 bachelor units (barracks and unaccompanied officers' quarters). Other facilities on the Main Post include community services (e.g., the shoppette, cafeteria, post exchange, bowling alley, golf course, and hospital), administrative buildings, classroom and training facilities, maintenance facilities, and ammunition storage.

The South Post is located south of Route 2 and contains training areas, ranges, and a drop zone. The North Post abuts the Main Post to the north of West Main Street in Ayer. The principal activities on the North Post are the Waste Water Treatment Plant and the Moore Army Airfield.

The terrain surrounding Fort Devens includes rolling areas and wooded hills. Fort Devens is located in the Nashua River Basin, and approximately 8 miles of the river, running from south to north, lie within the reservation boundaries (Figure 2-1). Several lakes and ponds are located within Fort Devens. Land surface elevations within Fort Devens range from about 200 feet above mean sea level (MSL) along the Nashua River on the northern boundary to 450 feet above MSL in the southern portion of the installation.

The surrounding towns (Ayer, Harvard, Shirley, and Lancaster) are zoned for residential, commercial, and limited industrial development. All have fewer than 10,000 residents, except Harvard, which has an estimated 13,000.

2.2 Regional Geology

The surficial geology throughout most of Fort Devens is characterized by glacially derived unconsolidated sediments. A mantle of Pleistocene-age glacial till, outwash, and lacustrine (lake) deposits, ranging in thickness from a few inches to approximately 100 feet, blanket the irregular bedrock surface underlying Fort Devens. The glacial lake deposits consist chiefly of sand and gravelly sand. Post-glacial deposits consist mostly of river-terrace sands and gravels; fine alluvial sands and silts beneath modern floodplains; and muck, peat, silt, and sand in swampy areas.

The surficial deposits are underlain by a complex assemblage of intensely folded and faulted metasedimentary rocks with occasional igneous intrusions. Bedrock occurs at depths of approximately 100 feet to ground surface where it outcrops at Shepley's Hill. Bedrock is typically unweathered to only slightly weathered at Fort Devens, as is typical in glacial terrain.

2.3 Regional Hydrogeology

Fort Devens lies within the Nashua River drainage basin. The Nashua River flows south to north through the installation, and is the eventual discharge locus for all surface water and ground water flow at the installation. The water of the Nashua River has been assigned to Class B under Commonwealth of Massachusetts regulations. Class B surface water is "designated for the uses of protection and propagation of fish, other aquatic life and wildlife, and for primary and secondary contact recreation" (314 CMR 4.03). The Nashua River and its major tributaries are shown on Figure 2-1.

Glacial outwash deposits constitute the primary aquifer at Fort Devens. Ground water also occurs in the underlying bedrock; however, flow is limited because the rocks have no primary porosity and water moves only in fractures and dissolution voids. Ground water in the surficial aquifer at Fort Devens has been assigned to Class I under Commonwealth of Massachusetts regulations. Class I consists of ground waters that are "found in the saturated zone of unconsolidated deposits or consolidated rock and bedrock and are designated as a source of potable water supply" (314 CMR 6.03). Ground water provides the main source of potable water for Fort Devens. Ground water is pumped from three large-diameter and 74 small-diameter production wells.

2.4 Study Area Description and History

2.4.1 Study Area Description and Land Use

SA-59 is located at Bridge 526, part of Lovell Street as the road passes over Pond Brook (also known as Tail Race Brook). The brook discharges into the Nashua River approximately 700 feet southeast of the bridge (Figure 2-2).

The study area consists of a two-lane bridge on Lovell Road, which crosses Pond Brook, and that portion of Pond Brook potentially impacted by sandblasting and release of sandblast grit.

2.4.2 Related Investigations and Site History

The bridge was identified as a study area in the *Enhanced Preliminary Assessment* (Weston, 1992b), but was not listed in the *Master Environmental Plan* (Argonne National Laboratory, 1992). According to the Enhanced PA, the bridge was sandblasted and repainted during the late summer of 1990. Analysis of one sample of

the grit produced by the sandblasting indicated a concentration of 1,275 μg/g of lead. To avoid discharge of the grit into the river, the contractor used a spent sandblast grit containment system during surface preparation and drummed the resulting waste. However, as a result of heavy rain and a possible discharge from the Lake Shirley Dam, the water level rose considerably and washed out the scaffolding and grit containment system. The Fort Devens Environmental Management Office (EMO) inspected the site and found sandblast grit on the stream banks, and on the bridge beams and abutments. The Enhanced PA reports that 10 soil samples collected by the EMO along the stream bank showed lead concentrations between 3.6 and 90 μg/g, with an average of about 32 μg/g. Documentation of the actual sample locations was not available.

2.4.3 Geology of Study Area SA-59

Pond Brook is located at an elevation of approximately 220 feet above MSL. The grade change on both sides of the brook is approximately 50 feet, resulting in steep banks.

The geologic deposits south of the brook in the vicinity of SA-51 are thought to be kame deposits. The drainage channel itself is likely underlain by alluvial deposits.

2.4.4 Hydrogeology of Study Area SA-59

Pond Brook flows eastward from Phoenix Pond into the Nashua River, located approximately 700 feet to the east. The brook is at an approximate elevation of 220 feet above MSL.

3.0 Site Investigation

3.1 Site Investigation Report

The scope of work for the site investigation was limited to review of records and evaluation of surface water and sediment samples collected from adjacent locations. Sediment and surface water samples were collected upstream of the bridge in Pond Brook and downstream of the bridge in the Nashua River, immediately downstream of the confluence of Pond Brook and the river. This data will be used to evaluate the potential impact of sandblast grit released from the bridge to surface water and sediments.

The Final SI report (Arthur D. Little, 1993), presents documentation of methods and activities performed during the Main Post SI and discusses the results of the SI, including conclusions and recommendations for each study area. The SI Report also incorporates responses to comments received on the SI Data Package. The SI Report recommends No Further Action SA-59.

3.2 Preliminary Risk Evaluation

The criteria and guidelines used for screening risks in the preliminary risk evaluation (PRE) are described below. A complete summary of criteria and guideline values used in the Main Post SI PREs is presented in the Main Post SI Report. Uncertainties associated with the risk evaluation methodologies are also discussed in the SI Report.

3.2.1 Human Health Risk Evaluation Methodology

3.2.1.1 Soil Risk Evaluation Methodology

EPA Region III Risk-Based Concentration Table. EPA Region III has developed risk-based soil concentrations based on published reference doses and cancer potency slopes and "standard" exposure scenarios. The concentrations reported correspond to a hazard quotient of 1, indicating no risk of noncarcinogenic effects, *or* a lifetime cancer risk of one in 1 million, whichever is lower. Both residential and commercial/industrial health-protective soil guidelines are published by EPA Region III.

Massachusetts Contingency Plan (MCP), July 1, 1993. Categories of health-protective soil guidelines were established by the Massachusetts Department of Environmental Protection (MADEP, 1993) for use in the characterization of risk posed by disposal sites. For assumed future residential use, study area concentrations are compared to the Method 1 GW-1/S-1 category. The S-1 category indicates that the soil is accessible and that both child and adult frequency or intensity of use may be high. The GW-1 category additionally assumes the potential use of the ground water as a drinking water source. For assumed future commercial/industrial use, study area soil concentrations are compared to the GW-1/S-2 category. The S-2 category indicates high adult use of the area, and minimal use of the area by children. For chemicals with no soil guidelines, we have used reportable concentrations published in the MCP

guidelines. It should be noted that although Method 1 standards are used for screening purposes in the PRE, Method 1 is strictly applicable to a disposal site if there is a standard for each oil and hazardous material of concern, and if the oil or hazardous material is present in and will foreseeably migrate only within ground water and soil.

3.2.2 Ecological Risk Evaluation Methodology

3.2.2.1 Soil Risk Evaluation Methodology

Surface Soil Ecological Protective Contaminant Levels. The ecological criteria (protective contaminant levels, PCLs) used for comparison to detected concentrations in soils were derived from the ABB chronic exposure food web model documented in the SI Report for Groups 2 and 7 (ABB, 1992). No state or federal standards or guidelines exist to evaluate potential effects due to the ingestion of food and surface soil by terrestrial organisms. The PCLs estimate the potential dietary exposure for several potential receptor species at Fort Devens, using published bioaccumulation factors (BAFs), dietary profiles, and ingestion rates for the indicator species. These PCLs are assumed to protect the most sensitive of the modeled indicator species (i.e., short-tailed shrew) from direct toxic effects and/or bioaccumulation-mediated toxic effects.

3.2.2.2 Surface Water Risk Evaluation Methodology

EPA Ambient Water Quality Criteria (AWQC). AWQC are developed (EPA, 1992) for the protection of aquatic life. The chronic aquatic AWQC are more applicable to the conditions found at Fort Devens, and thus are used in this PRE. AWQC are designed to be protective of most aquatic species in all life stages, and are based on chronic toxicological data for animals and plants, and on residue levels in aquatic organisms. If these criteria are not exceeded, most species of aquatic life would be protected. The chronic AWQC is the contaminant concentration that should not be exceeded by the four-day average chemical concentration more than once every three years. When hardness data are available from the study area, hardness-dependent chronic AWQC (for selected inorganics) are adjusted using an average hardness for the study area.

3.2.2.3 Sediment Risk Evaluation Methodology

Detected concentrations of contaminants in sediments are compared to the following two guidelines: the National Oceanographic and Atmospheric Administration (NOAA) Effects Range - Low (NOAA, 1990), and the New York State Department of Environmental Conservation (NYSDEC) Sediment Quality Criteria (NYSDEC, 1989). In addition, sediment concentrations are compared to ecological soil protective contaminant levels (PCLs). The rationale for including surface soil guidelines in these comparisons is that during summer, the sediments in wetlands and along the Nashua River banks may dry out and become exposed. During these dry periods, terrestrial species may be exposed to contaminants in surface soils via the ingestion of earthworms or other invertebrates.

National Oceanographic and Atmospheric Administration Effects Range - Low. NOAA has collected data on sediment toxic effects levels for various biota from sites throughout the U.S. (NOAA, 1990). These data were compiled in order of concentration associated with biological effects, and the lower 10th percentile and median concentrations of the data were identified. The lower 10 percentile of the data is identified as an Effects Range-Low (ER-L), while the median value is termed an Effects Range-Median (ER-M). study area sediment data are compared to ER-L sediment toxicity values; this is a conservative approach, which is appropriate for this screening level risk assessment.

New York State Department of Environmental Conservation Sediment Quality Criteria. For organic compounds, the NYSDEC Sediment Quality Criteria (NYSDEC, 1989) have been calculated using the equilibrium partitioning approach, and use the ambient water quality standard or guidance value for each chemical. This approach is based on the theory that toxics in sediments will exert their effect to the extent that the chemical becomes freely bioavailable in the sediment interstitial water. The bioavailability of non-polar organics in sediments is based on the fraction of organic carbon in the sediment (the sediment/organic carbon partition coefficients, or K_{oc}). Since the octanol/water partition coefficient (K_{ow}) is nearly equal to the sediment/organic carbon partition coefficient, the K_{ow} was used by NYSDEC in the calculation. To derive a sediment criterion for a specific sediment, the NYSDEC Sediment Quality Criterion is multiplied by the average of the organic carbon content values in sediments for each study area. For inorganics, the NYSDEC criteria are based on a geometric mean of a no-effect and lowest effect level for benthic organisms to derive sediment criteria.

4.0 Contamination Assessment

4.1 Sediment Sampling Evaluation

Evaluation of lead concentrations in sediments collected during the Main Post SI from the immediate vicinity of SA-59, both upstream and downstream of Bridge 526 (Figure 4-1) indicate that lead concentrations are significantly higher in the downstream Nashua River locations NRD-93-09X and NRD-93-10X (240 and 61 µg/g respectively) when compared with the upstream Pond Brook location NRD-93-01X (12.9 µg/g). The lead concentration of 12 µg/g at the downstream Nashua River location NRD-93-08X is comparable to the upstream Pond Brook location.

When a comparison of lead concentrations at locations NRD-93-08X, 09X, and 10X is made with locations both upstream and downstream in the Nashua River as part of other investigations during the Main Post SI, higher lead concentrations are found in both directions (i.e., 1,400 µg/g at the farthest upstream location NRD-93-06X and 760 µg/g at the farthest downstream location, NRD-93-13X (see Main Post SI Report, Arthur D. Little, 1993). Therefore, there is no indication from the Nashua River sampling data that lead contamination derived from SA-59 has had a negative impact on the Nashua River.

4.2 Surface Water Sampling Evaluation

No lead concentrations were detected in either the upstream surface water location NRW-93-01X or the downstream surface water location NRW-93-08X.

5.0 Preliminary Risk Evaluation

5.1 Risk Evaluation of Study Area SA-59

The Enhanced PA (Weston, 1992b) reports that 10 soil samples collected by the EMO along the stream bank showed lead concentrations between 3.6 and 90 µg/g, with an average of about 32 µg/g. The average concentration does not significantly exceed the NYSDEC sediment criteria of 27 µg/g or the NOAA Effects Range-Low level of 35 µg/g. The maximum concentration is approximately threefold higher than the criteria, but is within one order of magnitude of the criteria.

Furthermore, the results of sampling and analysis of Pond Brook and Nashua River sediments performed during the SI do not indicate that lead contamination derived from SA-59 has had a negative impact on the Nashua River.

Surface water of the Nashua River exceeded AWQC only for phosphorous and alkalinity, whereas Pond Brook showed an exceedence of the AWQC only for alkalinity. Nashua River sediments in this area exceeded the NOAA sediment guidelines for five polynuclear aromatic hydrocarbons, four pesticides, seven inorganic compounds, and TPHC, as well as the NYSDEC sediment criteria for bis(2-ethylhexyl)phthalate, four pesticides, and nine inorganics. Pond Brook sediments, collected upstream of Bridge No. 526, exceeded the NOAA ER-L for DDE and mercury, and exceeded the NYSDEC criteria for arsenic, chromium, manganese, and mercury. Although these exceedances pose some ecological risk to benthic biota of both Pond Brook and the Nashua River, no obvious effects of Pond Brook, Bridge 526, or other portions of SA-59 can be discerned as having occurred to the Nashua River, since the observed range of contaminants in the river sediments is inclusive of the levels detected in Pond Brook.

6.0 Conclusions

No further action is recommended at SA-59. This recommendation is based on the historical information regarding the use of the site, historical sampling data, visual observations, and the results of sampling and analysis.

Stream bank sediments collected by EMO indicated lead concentrations comparable to existing risk-based sediment criteria for lead. There is some potential for sandblast grit to migrate downstream in Pond Brook and to the Nashua River. However, results of Nashua River sediment sampling performed during the SI do not indicate that lead contamination from the Study Area has had a discernible impact on the River.

7.0 Decision

On the basis of findings at SA-59, there is no evidence or reason to conclude that the historic release of sandblast grit at SA-59 has caused significant environmental contamination or poses a threat to human health or the environment. The decision has been made to remove SA-59 from further consideration in the Installation Restoration Program (IRP) process. In accordance with CERCLA 120(h)(3), all remedial actions necessary have taken place, and the USEPA and MADEP signatures constitute concurrence in accordance with the same.

James C Chambers — 18 JAN 95

JAMES C. CHAMBERS — Date
BRAC Environmental Coordinator

U.S. ENVIRONMENTAL PROTECTION AGENCY

James P. Byrne — 1/18/95

JAMES P. BYRNE — Date
Fort Devens Remedial Project Manager

[X] Concur
[ ] Non-concur (please provide reasons for non-concurrence in writing)

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

D. Lynne Welsh — 1/18/95

D. LYNNE WELSH — Date
Section Chief, Federal Facilities - CERO

[X] Concur
[ ] Non-concur (please provide reasons for non-concurrence in writing)

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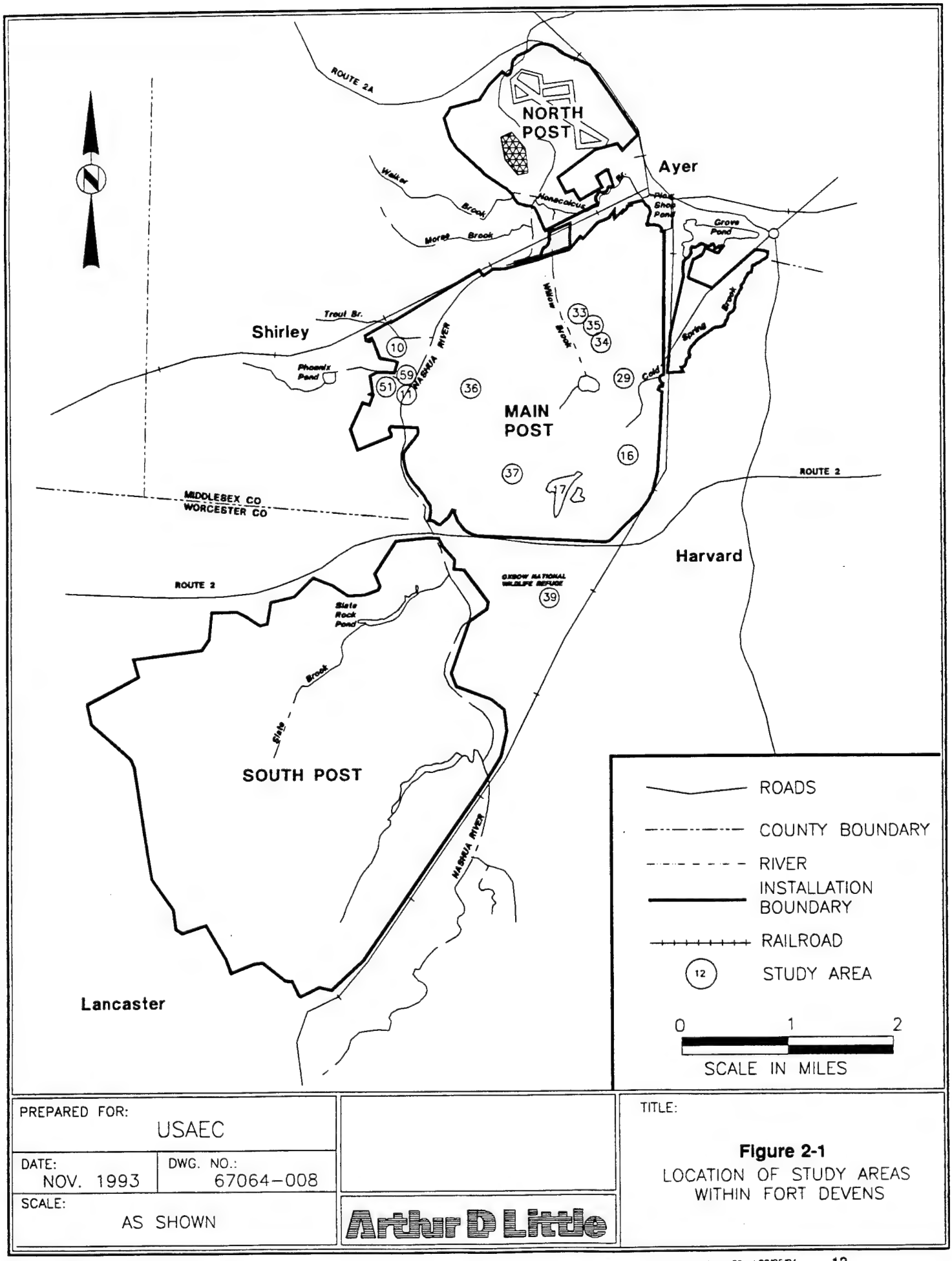

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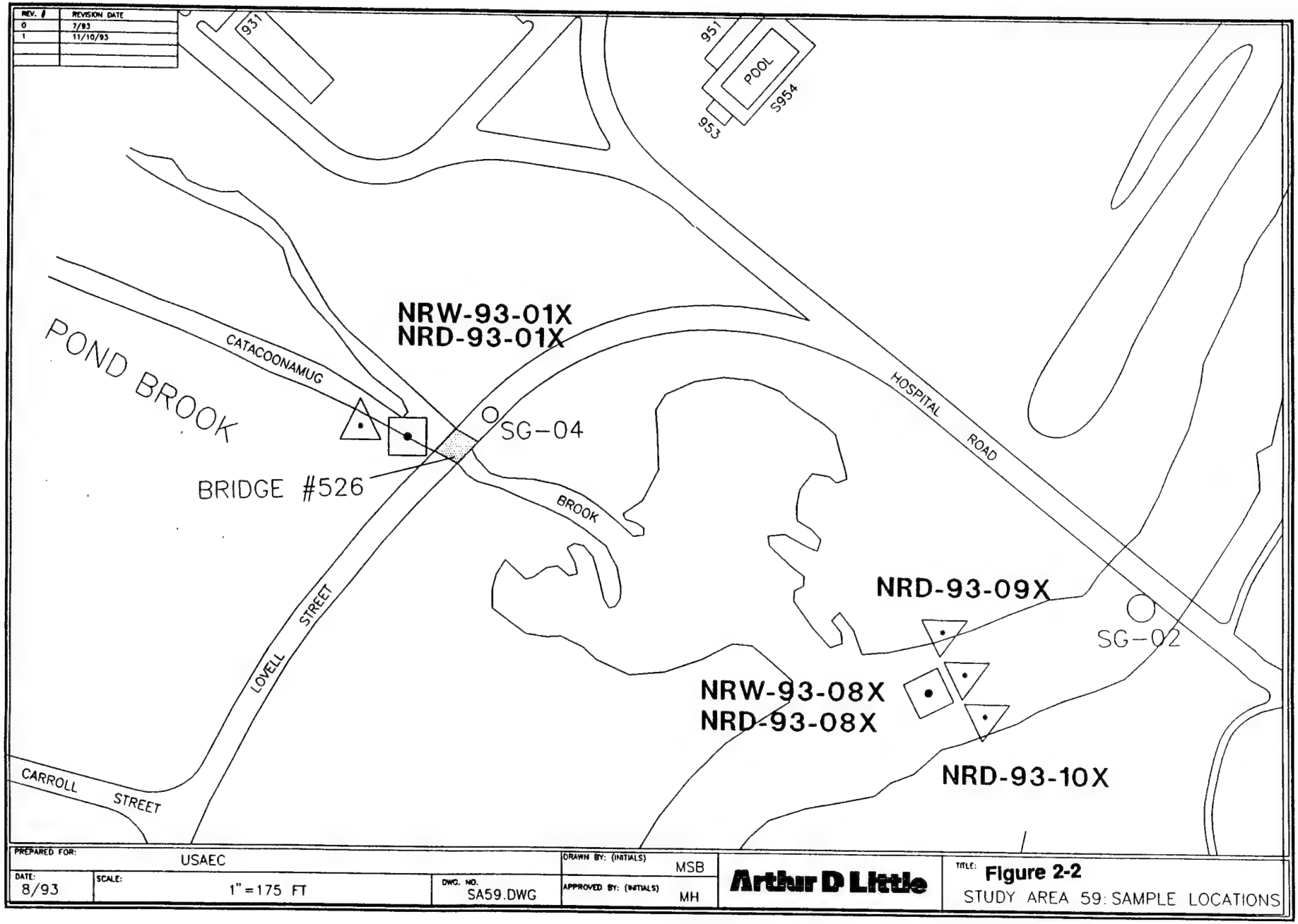
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Arthur D Little
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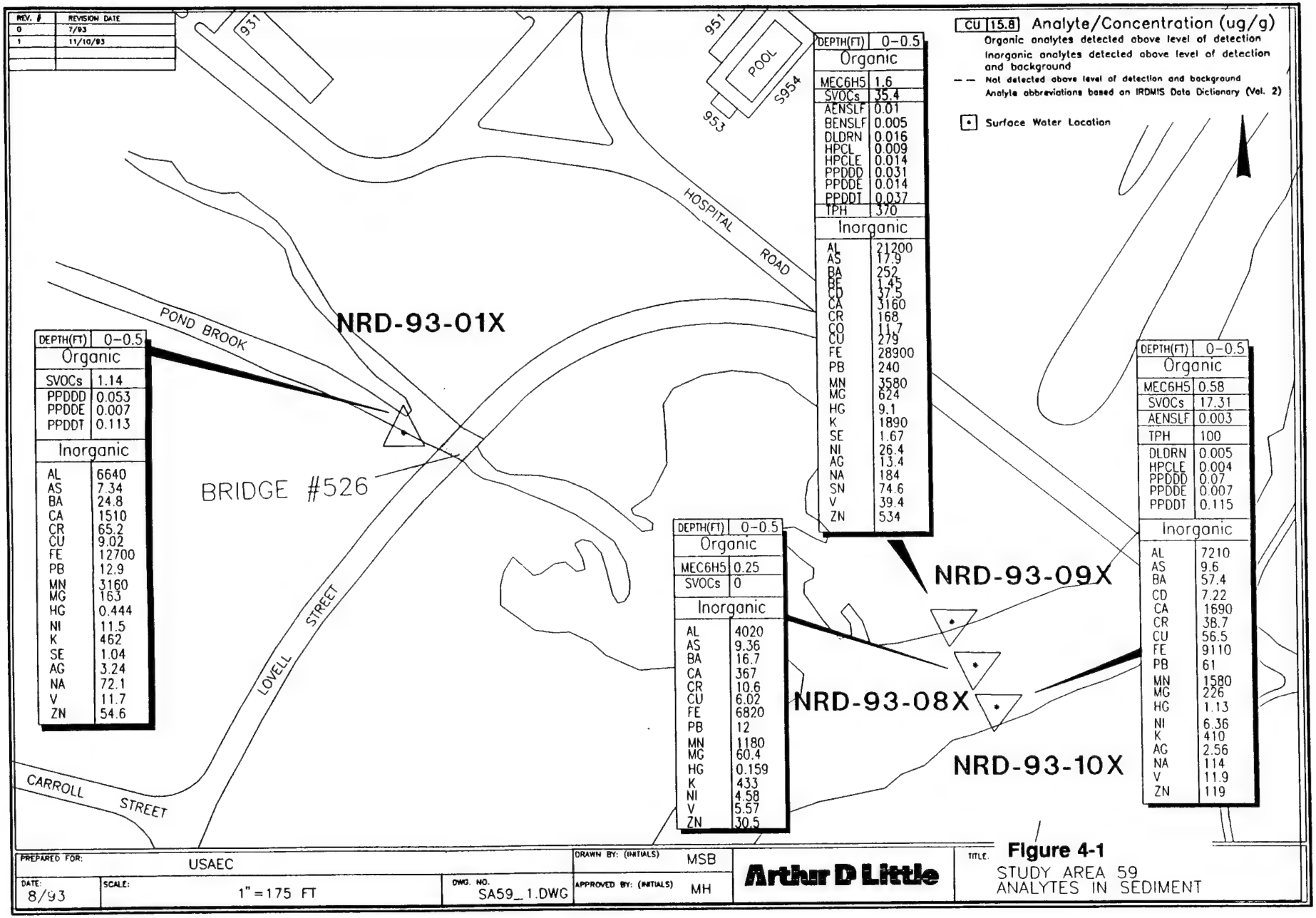

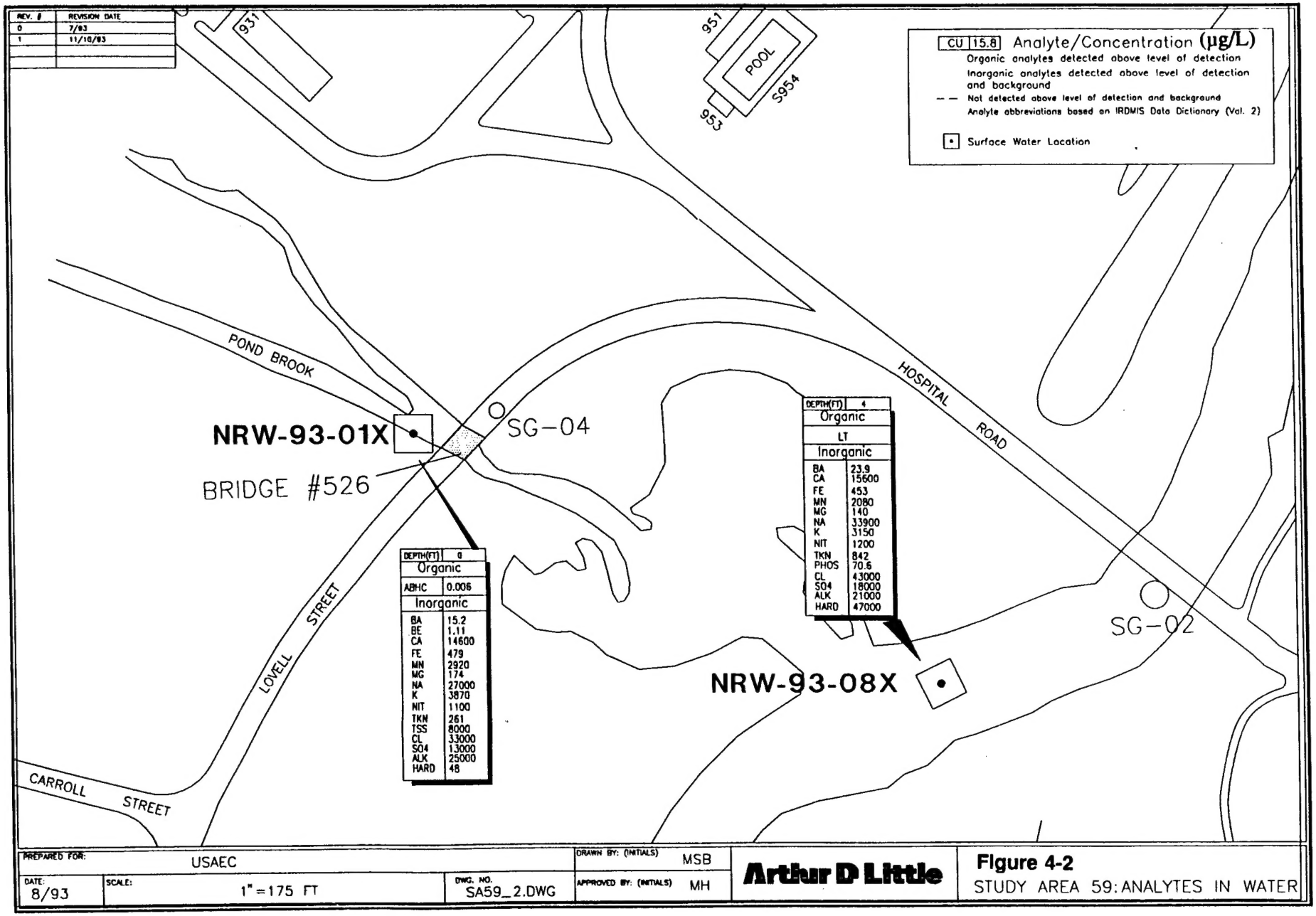

Figure 4-2
STUDY AREA 59: ANALYTES IN WATER

Table 4-1

Fort Devens Main Post Site Investigation
Study Area 59 - Analytes in Sediments

Site ID Field Sample ID Sample Depth (ft)	TOC-Adjusted NYSDEC Sediment Crit.	NOAA Sediment Criteria	Ecological Surface Soil Criteria	Fort Devens Soil Background	NRD-93-08X ALXSD06C 0 - 0.5	NRD-93-09X ALXSD06E 0 - 0.5	NRD-93-10X ALXSD06W 0 - 0.5	NRD-93-01X ALXSD01X 0 - 0.5
Volatile Organic Compounds (ug/g)								
Aromatics								
Toluene	--	--	1800		0.25	1.6	0.58	0.1 LT
Semivolatile Organic Compounds (ug/g)								
Phthalates								
Di-N-butyl phthalate	--	--	2650		1.3 LT	1.3 LT	4.1	1.3 LT
Bis(2-ethylhexyl)phthalate	4.788	--	84		0.48 LT	18 NY,	6.4 NY,	0.48 LT
Polynuclear Aromatics								
Acenaphthylene	--	--	2600		0.033 LT	1.4	0.65	0.033 LT
Phenanthrene	5.56	0.225	510		0.032 LT	1.9 - NOAA,	0.89 - NOAA,	0.33 - NOAA,
Fluoranthene	--	0.6	1100		0.032 LT	2.1 - NOAA,	0.88 - NOAA,	0.15
Pyrene	--	0.35	550		0.083 LT	3.6 - NOAA,	1.8 - NOAA,	0.31
Benzo (a) Anthracene	--	0.23	8.9		0.041 LT	1.6 - NOAA,	0.62 - NOAA,	0.16
Chrysene	--	0.4	440		0.032 LT	2.7 - NOAA,	1.1 - NOAA,	0.19
Benzo (b) Fluoranthene	--	--	180		0.31 LT	4.1	0.31 LT	0.31 LT
Benzo (k) Fluoranthene	--	--	320		0.13 LT	0.13 LT	0.87	0.13 LT
Pesticides/Herbicides/PCBs (ug/g)								
Organochlorine Pesticides								
Endosulfan I	0.0012	--	--		0.001 LT	0.01 NY,	0.003 NY,	0.001 LT
Endosulfan II	0.0012	--	--		0.001 LT	0.005 NY,	0.001 LT	0.001 LT
Dieldrin	0.78	0.00002	--		0.002 LT - NOAA,	0.016 - NOAA,	0.005 - NOAA,	0.002 LT - NOAA,
Heptachlor	0.0012	--	0.64		0.002 LT NY,	0.009 NY,	0.002 LT NY,	0.002 LT NY,
Heptachlor Epoxide	0.0012	--	--		0.001 LT	0.014 NY,	0.004 NY,	0.001 LT
p,p'-DDD	--	0.002	1.07		0.003 LT - NOAA,	0.031 - NOAA,	0.07 - NOAA,	0.053 - NOAA,
p,p'-DDE	2	0.002	1.07		0.003 LT - NOAA,	0.014 - NOAA,	0.007 - NOAA,	0.007 - NOAA,
p,p'-DDT	--	0.001	1.07		0.004 LT - NOAA,	0.037 - NOAA,	0.115 - NOAA,	0.113 - NOAA,
Explosives (ug/g)								
not detected or below detection limit								
Total Petroleum Hydrocarbons (ug/g)	--	4	--	--	10 LT - NOAA,	370 - NOAA,	100 - NOAA,	10 LT - NOAA,

Notes:
LT = Less than detection limit
ND = Not detected
B = Above background soil concentrations
NOAA = Above NOAA sed. crit.
E = above suface soil eco. crit.
NY = above NY sed. crit.
* TOC = 4%

Table 4-1

Fort Devens Main Post Site Investigation
Study Area 59 - Analytes in Sediments

Site ID Field Sample ID Sample Depth (ft)	TOC-Adjusted NYSDEC Sediment Crit.	NOAA Sediment Criteria	Ecological Surface Soil Criteria	Fort Devens Soil Background	NRD-93-06X ALXSD06C 0 - 0.5					NRD-93-09X ALXSD06E 0 - 0.5					NRD-93-10X ALXSD06W 0 - 0.5					NRD-93-01X ALXSD01X 0 - 0.5				
Metals (ug/g)	Metals not adjusted for TOC																						
Aluminum	--	--	1700	15000	4020	-	-	E	-	21200	-	-	E	B	7210	-	-	E	-	6640	-	-	E	-
Arsenic	5	33	33	21	9.36	NY,	-	-	-	17.9	NY,	-	-	-	9.6	NY,	-	-	-	7.34	NY,	-	-	-
Barium	--	--	41	42.5	16.7	-	-	-	-	252	-	-	E	B	57.4	-	-	E	B	24.8	-	-	-	-
Cadmium	0.8	5	0.44	2	1.2	LT NY,	-	E	-	37.5	NY,	NOAA,	E	B	7.22	NY,	NOAA,	E	B	1.2	LT NY,	-	E	-
Calcium	--	0	--	1400	367	-	-	-	-	3160	-	-	-	B	1690	-	-	-	B	1510	-	-	-	B
Chromium	26	80	180	31	10.6	-	-	-	-	168	NY,	NOAA,	-	B	38.7	NY,	-	-	B	65.2	NY,	-	-	B
Cobalt	--	--	50	--	2.5	LT -	-	-	-	11.7	-	-	-	-	2.5	LT -	-	-	-	2.5	LT -	-	-	-
Copper	19	70	34	8.39	6.02	-	-	-	-	279	NY,	NOAA,	E	B	56.5	NY,	-	E	B	9.02	-	-	-	B
Iron	--	--	--	15000	6820	-	-	-	-	28900	-	-	-	B	9110	-	-	-	-	12700	-	-	-	-
Lead	27	35	4	48.4	12	-	-	E	-	240	NY,	NOAA,	E	B	61	NY,	NOAA,	E	B	12.9	-	-	E	-
Magnesium	--	--	--	5600	1180	-	-	-	-	3580	-	-	-	-	1580	-	-	-	-	3160	-	-	-	-
Manganese	428	--	1500	300	60.4	-	-	-	-	624	NY,	-	-	B	226	-	-	-	-	163	-	-	-	-
Mercury	0.11	0.15	3.6	0.22	0.159	NY,	NOAA,	-	-	9.1	NY,	NOAA,	E	B	1.13	NY,	NOAA,	-	B	0.444	NY,	NOAA,	-	B
Nickel	22	30	100	14	4.58	-	-	-	-	26.4	NY,	-	-	B	6.36	-	-	-	-	11.5	-	-	-	-
Potassium	--	--	--	1700	433	-	-	-	-	1890	-	-	-	B	410	-	-	-	-	462	-	-	-	-
Selenium	--	--	0.48	--	0.449	LT -	-	-	-	1.67	-	-	E	-	0.449	LT -	-	-	-	1.04	-	-	E	-
Silver	--	1	72	0.086	0.803	LT -	-	-	B	13.4	-	NOAA,	-	B	2.56	-	NOAA,	-	B	3.24	-	NOAA,	-	B
Sodium	--	--	--	131	38.7	LT -	-	-	-	184	-	-	-	B	114	-	-	-	-	72.1	-	-	-	-
Tin	--	--	--	--	7.43	LT -	-	-	-	74.6	-	-	-	-	7.43	LT -	-	-	-	7.43	LT -	-	-	-
Vanadium	--	--	10	28.7	5.57	-	-	-	-	39.4	-	-	E	B	11.9	-	-	E	-	11.7	-	-	E	-
Zinc	85	120	640	35.5	30.5	-	-	-	-	534	NY,	NOAA,	-	B	119	NY,	-	-	B	54.6	-	-	-	B

Notes:
LT = Less than detection limit
ND = Not detected
B = Above background soil concentrations
NOAA = Above NOAA sed. crit.
E = above suface soil eco. crit.
NY = above NY sed. crit.
* TOC = 4%

Table 4-2
Fort Devens Main Post Site Investigation
Study Area 59 - Analytes in Surface Water

Site ID Field Sample ID Sample Depth (ft)	Ambient Water Quality Criteria	NRW-93-01X ALXSW01X 0			NRW-93-08X ALXSW06C 4		
Volatile Organic Compounds (ug/L)							
not detected or less than detection limit	--						
Semivolatile Organic Compounds (ug/L)							
not detected or less than detection limit	--						
Total Petroleum Hydrocarbons (ug/L)							
not detected or less than detection limit							
Organochlorine Pesticides and PCBs (ug/L)							
alpha-benzenehexachloride	--	0.006		-	0.003	LT	-
Metals (ug/L)							
Barium	--	15.2		-	23.9		-
Beryllium	5.3	1.11		-	1.12	LT	-
Calcium	--	14600		-	15600		-
Iron	1000	479		-	453		-
Magnesium	--	2920		-	2080		-
Manganese	--	174		-	140		-
Potassium	--	3870		-	3150		-
Sodium	--	27000		-	33900		-
Water Quality Parameters (ug/L)							
Nitrate/Nitrite	--	1100		-	1200		-
Phosphorous	0.1	10	LT	E	70.6		E
Total Nitrogen	--	261		-	842		-
Total Suspended Solids	--	8000		-	4000	LT	-
Chloride	230000	33000		-	43000		-
Sulfate	--	13000		-	18000		-
Alkalinity	20000	25000		E	21000		E
Total Hardness	--	48		-	47000		-

Notes:
ND = Not detected
LT = Less than detection limit
E = above surface water criteria
*AWQCs for copper, lead, nickel, and zinc are based on a water hardness of 20 mg/L